U.S. NUCLEAR REGULATORY COMMISSION

REGION I

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Licensee:	Northeast Nuclear Energy Company (NNECo)
Facility:	Millstone Nuclear Power Station, Units 2 and 3
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EXECUTIVE SUMMARY

This inspection involved a review of Northeast Nuclear Energy Company's (NNECo) implementation of the maintenance rule, as required by 10 CFR 50.65, at the Millstone Unit 2 nuclear generating station and of previously open issues at Unit 3. The report covers a one week onsite inspection by regional and headquarter's inspectors during the week of May 18-22, 1998.

The team concluded that NNECo had implemented an effective, thorough maintenance rule program at Millstone Unit 2, based on the following aspects.

- Millstone Unit 2 had completed a thorough scoping review of all systems, structures and components (SSCs) under the scope of the maintenance rule and had correctly scoped all the SSCs reviewed by the team. For those SSCs that were excluded from the scope of the rule, justification was found to be correct and complete.

- The licensee's approach to determining the safety significance of SSCs within the scope of the Maintenance Rule was adequate. Also, the approach to establishing performance criteria was appropriate. However, the team identified that the 1993 Individual Plant Examination (IPE), and its associated sensitivity study were not being maintained current in support of the assessment of performance criteria.

- The Expert Panel was appropriately performing its assigned functions in evaluating maintenance rule issues. Based on the observation of one Expert Panel meeting, the panel's interaction with the system engineers and the evaluation and critique of corrective action plans appeared strong.

- The licensee, with few exceptions, appropriately identified system functional failures as they occurred and these failures were well known and understood by the responsible system engineer (SE). The related corrective action had been suitably captured in the corrective action program, and appropriate corrective actions had been instituted. The team reviewed goals and corrective actions established by Northeast Utilities (NE) for identified (a)(1) SSCs and found them to be acceptable. SSC performance criteria were appropriately linked to the PRA. The overall material condition of the SSCs walked down was good.

- The team also identified that physical boundaries for functions that relied on components in multiple systems were not clearly defined for performance monitoring, which could result in an incorrect assessment of maintenance effectiveness. Also, the team noted an implementation problem in the determination of maintenance rule functional failures (MRFFs) during the review of the control room air conditioning (CRAC) and safety injection tanks (SIT) systems. Collectively, these implementation problems will be reviewed during a future inspection following plant restart **(IFI 50-336/98-02-01)**

- The team found that, because of the recent operating status of Millstone Unit 2, the operational history of many normally operating systems and the start demands on many standby systems have been insufficient to adequately assess the effectiveness of the licensee's maintenance and performance monitoring programs. These activities will be reviewed during a future inspection **(part of IFI 50-336/98-02-02)**.

- The team determined that appropriate goal setting was in place for those SSCs that were in an (a)(1) status. The team also concluded that corrective and preventive maintenance was appropriate and effective for those SSCs in (a)(2).

- The facility placed systems in an (a)(1) status when necessary and developed action plans with appropriate corrective actions and goals to improve system performance. The Expert Panel critically evaluated these action plans. Goals and performance criteria were established in a manner that would assure the systems are capable of performing their intended safety function.

- Based on the review of the program documents and the two (a)(3) periodic assessments, the team noted that these assessments were comprehensive and identified valid findings. The program adequately implemented balancing availability and reliability. The evaluation reflected a thorough approach and it met the requirements of paragraph (a)(3) of the rule for balancing availability and reliability. Follow-up activity will be accomplished when unavailability data becomes present after start-up. The balancing of unavailability and reliability data, when it becomes available, will be further reviewed **(part of IFI 50-336/98-02-02)**.

- The licensee's procedure for assessing plant risk while the plant is shut down was considered to be acceptable. However, because Millstone Unit 2 had been shut down for over two years, the licensee's actual performance in the area of on-line risk evaluation could not be assessed **(part of IFI 50-336/98-02-02)**.

- The inspection team determined that the overall material condition of those SSCs selected for review were being maintained in good condition. Housekeeping was generally good except for conditions inside the containment.

- SEs had good knowledge of their systems and acceptable knowledge of their Maintenance Rule (MR) responsibilities including scoping, monitoring, and trending. The SEs weak understanding of system boundaries and interfacing functions appears to be due to unclear procedural guidance (see page 11 of report).

- Licensed operator's understanding of the maintenance rule was acceptable. However, operators were not familiar with risk management tools developed for on-line maintenance due to the current plant operational status **(part of IFI 50-336/98-02-02**, see Paragraph M1.6).

- The self assessments and audit reports were detailed and thorough. The thoroughness of the audit findings helped to ensure that Millstone 2 is correctly implementing the requirements of the maintenance rule. Filling the vacancy of the maintenance coordinator with a certified Reliability Engineer is considered a positive step to ensure a strong background in equipment reliability.

Report Details

II. Maintenance

M1 Conduct of Maintenance (62706)

The inspection was conducted to verify that the implementation of the maintenance rule program, as required by 10 CFR 50.65, was effectively implemented at the Millstone Unit 2 facility. The team used inspection procedure (IP) 62706, "Maintenance Rule," NUMARC 93-01, Revision 2, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," and Regulatory Guide (RG) 1.106, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," as references during the inspection.

M1.1 Structures, Systems and Components (SSCs) Included Within the Scope of the Rule

a. Inspection Scope

Scoping was previously conducted at Millstone Unit 2 during NRC inspection 50-336/97-80. During that inspection the team identified several SSCs that should have been included in the scope of the Maintenance Rule and were not. A violation was issued (50-336/97-80-01). During this inspection the team reviewed the scoping documentation to determine if the appropriate SSCs were included within the maintenance rule program in accordance with 10 CFR 50.65(b) and reviewed the licensee's response to the Notice of Violation for both unit 2 and 3 (discussed in Section M8 of this report).

b. Observations and Findings

The Team verified that systems not previously in scope were now in scope. The team also performed a Phase 2 (determination of SSC functions) scoping review to verify that system functions for those systems determined in Phase 1 (determination of SSCs within scope) scoping to be in the scope of the maintenance rule (MR) were appropriate. The team used Program Instruction (PI) 1.2, "Scoping Phase 2," Revision 1, as reference for the review. The team did not identify any Phase 1 or 2 scoping errors during the review.

The team found that Millstone Unit 2 had identified scoping boundaries for each system and components within each system that had been included within the scope of the maintenance rule. However, as discussed in Section M1.4, the system interface boundaries were not always clearly defined in the SSC performance criterion.

c. Conclusions

Millstone Unit 2 had completed a thorough scoping review of all SSCs under the scope of the maintenance rule and had correctly scoped all the SSCs reviewed by the team. For those SSCs that were excluded from the scope of the rule, justification was found to be correct and complete.

M1.2 Safety (Risk) Determination and Risk Ranking

a. Inspection Scope

The team reviewed the methods that the licensee had established for making required safety determinations and setting goals commensurate with safety. The team also reviewed the safety determinations that were made for the systems that were reviewed in detail through walkdown and other focused activities during this inspection.

b. Observations and Findings

Safety or Risk Significance Determination Methodology

Probabilistic risk assessment (PRA) input to the Maintenance Rule is an important aspect of the licensee's overall program. During the inspection, the team reviewed the Millstone Unit 2 Individual Plant Examination (IPE), Individual Plant Examination of External Events (IPEEE), and Staff Evaluation Report (SER) of the IPE, and interviewed the IPE representative. The IPE was a small event tree and large fault tree model, and the CAFTA suite of computer codes was used to develop and quantify the model. The SER concluded that the December 1993 IPE met the requirements of Generic Letter 88-20, "Individual Plant Examination For Severe Accident Vulnerabilities," and associated guidance in NUREG-1335, "Individual Plant Examination: Submittal Guidance." Plant-specific data before 1988 were used in the IPE. These data and the December 1993 IPE had not been updated (to include more current data and plant design) to support the Maintenance Rule. This was considered a weakness by the team. It was noted that the licensee planned to update the IPE by March 1999.

The licensee's process for establishing the safety significance of SSCs within the scope of the Maintenance Rule was documented in Program Instruction PI 2, Revision 2, "Risk Significance Determination," (May 1, 1997). Additional PRA-related guidance was found in NUSCO PSA Guideline #3, "Maintenance Rule Form 5 Update Methodology" (July 19, 1996) and Guideline #10, "Incorporating IPEEE Insights into Maintenance Rule" (June 5, 1997). These documents were reviewed.

For SSCs modeled in the licensee's IPE, three importance measures were evaluated (core damage frequency contribution, risk achievement worth, and risk reduction worth), as recommended in NUMARC 93-01. If a basic event's importance measure met one or more of the criteria, then the SSC associated with that basic event was judged to have potentially high safety significance. Because the NUMARC 93-01 guidance indicated that a basic event has potentially high safety significance if any of the three importance measure criteria were met, the approach used by the licensee was adequate.

The licensee also evaluated all SSCs within the scope of the Maintenance Rule using a Delphi approach. This approach considered how important each SSC was with respect to six critical safety functions and all IPE initiating events. Results for each function were weighted and summed to obtain a single importance number for each SSC function. SSCs with importance numbers greater than or equal to 2.25 were considered to potentially have high safety significance.

The licensee's Expert Panel made the final safety significance determinations, based on IPE and Delphi results. In general, the Expert Panel followed the IPE and Delphi results recommendations. However, 11 of the SSCs were downgraded from high to low safety significance. In all of these cases, the IPE inputs indicated low safety significance (or the SSC was not modeled in the IPE). Therefore, the Expert Panel's actions were essentially a re-evaluation of the Delphi process results. None of the downgrades appeared to be unreasonable.

Performance Criteria

The team reviewed the licensee's performance criteria to determine if the licensee had adequately set performance criteria under (a)(2) of the Maintenance Rule consistent with the assumptions used to establish the safety significance. Section 9.3.2 of NUMARC 93-01 recommends that risk significant SSC performance criteria be set to assure that the availability and reliability assumptions used in the PRA are maintained.

The licensee's process for establishing performance criteria was documented in Program Instruction PI 3, Revision 3, "Performance Criteria," (February 13, 1997). The PRA basis for performance criteria was documented in NUSCO PSA Guideline #7, "Technical Basis for Unavailability Performance Criteria" (March 10, 1997) and Guideline #6, "Technical Basis for Functional Failure Count Performance Criteria," Revision 2 (September 9, 1997). All three documents were reviewed and found to be adequate.

The team reviewed a majority of the SSC performance criteria for appropriateness. For all SSCs reviewed, the appropriate types of performance criteria had been used. For example, high safety significance SSCs had system or train level unavailability and reliability performance criteria. (Exceptions to this, where unavailability criteria were not appropriate, were adequately explained.) Also, low safety significance, standby SSCs had system or train level reliability performance criteria. Finally, plant-level performance criteria, where used, were appropriate indicators of SSC performance.

The team also reviewed the IPE basis for unavailability and reliability performance criteria. For reliability performance criteria, the licensee used the EPRI methodology outlined in Technical Bulletins 96-11-01, "Monitoring Reliability for the Maintenance Rule" (November 1996) and 97-3-01, "Monitoring Reliability for the Maintenance Rule - Failures to Run" (March 1997). A 5% confidence level was used with that methodology to determine allowable functional failures (FFs).

In general, the unavailability performance criteria were approximately twice the values used in the IPE. Therefore, the licensee performed a sensitivity calculation to determine the impact on core damage frequency (CDF) of the unavailability performance criteria. The calculation was documented in Memo NE-97-SAB-078, "MP2 Maintenance Basic Events Evaluated at Performance Criteria" (April 10, 1997). The CDF changed from 3.5E-5/year to 5.7E-5/year, or a 62% increase. However, that calculation did not include several recent unavailability performance criteria, such as those for the 120 Vac vital buses A and B, 4160 Vac emergency buses A and B, and 125 Vdc emergency power. Because the existing sensitivity calculation was not up-to-date and did not conclude whether the 62% increase in CDF was acceptable, the team considered the out of date sensitivity calculation a problem.

c. Conclusions

The licensee's approach to determining the safety significance of SSCs within the scope of the Maintenance Rule was adequate. Also, the approach to establishing performance criteria was appropriate. However, the team identified that the 1993 IPE and its associated sensitivity study were not being maintained current in support of the assessment of performance criteria.

M1.3 Expert Panel

a. Inspection Scope

The team reviewed OA10 "Millstone Station Maintenance Rule Program" and determined the facility uses an "Expert Panel" to assist with maintenance rule related decisions. The composition, duties, and responsibilities of this panel were described in OA10, Attachment 4, "Maintenance Rule Expert Panel Charter." The team interviewed panel members, reviewed meeting minutes, and attended one meeting to assess the conduct of panel activities.

b. Observations and Findings

The Expert Panel was comprised of eight members from operations, I&C, engineering, maintenance, safety analysis, PRA, and reactor engineering. All were senior engineers or supervisors; five, including the chairman, were current or former senior reactor operators (SROs) licensed on this unit.

The Expert Panel had previously approved the selection of which SSCs were in scope, which were classified as risk significant, and what the performance criteria should be. The results of this determination were documented in the scoping document. Ongoing responsibilities included evaluation and concurrence with action plans for systems classified as a(1), evaluation of status reports from system engineers on the progress of action plans, and evaluation of any proposed changes to scoping, performance criteria, or action plans.

The meeting observed by the team evaluated the revision 3 corrective action plan for the (a)(1) instrument air system and the revision 0 corrective action plan for the (a)(1) emergency lighting system. The updated instrument air plan incorporated additional failures that had occurred and proposed new preventive maintenance items. Both corrective action plans were presented by the system engineers for these systems. Both system engineers were well prepared to answer the panel's questions and all panel members participated in the discussions. The panel accepted the instrument air system plan, but wanted more information concerning the emergency lighting system.

Review of expert panel meeting minutes indicates that meetings are conducted at least every two weeks, but with no set schedule. The chairman stated that meetings were held on an as needed basis. Content of the minutes shows ongoing evaluation of the status of (a)(1) systems.

c. Conclusions

The expert panel was appropriately performing its assigned functions in evaluating maintenance rule issues. Based on the observation of one Expert Panel meeting, their interaction with the system engineers and the evaluation and critique of corrective action plans appeared strong.

M1.4 (a)(1) Goal Setting and Monitoring and (a)(2) Preventive Maintenance

a.1 Inspection Scope

The team reviewed Northeast Utility (NE) program documents in order to evaluate the process established to set goals and monitor under (a)(1) and to verify that preventive maintenance had been demonstrated to be effective for systems, structures and components (SSCs) under (a)(2) of the maintenance rule. The assessment on each SSC included a verification that goals and performance criteria were established in accordance with safety, that industry-wide operation experience was taken into consideration, that appropriate monitoring and trending were being performed, and that corrective actions were taken when an SSC failed to meet its goal, performance criteria, or experienced a maintenance rule functional failure (MRFF). Team members also discussed system performance as it related to the MR program and performed a system walkdown to assess SSC material condition with the responsible system engineers (SEs) or designees. Assessments were performed on the following SSCs:

- Diesel Generator System (system No. 2346A) (a)(2)
- Diesel Rooms Ventilation System(system No. 2315E) (a)(1)
- Structures (various)
- Control Room Air Conditioning (system No. 2315A) (a)(1)
- Shutdown Cooling (system No. 2310) (a)(2)
- Chemical and Volume Control System (system No. 2304A) (a)(2)
- Reactor Protection System (system No. 2406) (a)(2)
- 480 Volt Load Centers (system No. 2344A) (a)(1)
- Containment Isolation (system No. 2003) (a)(1)
- Auxiliary Feedwater System (system No. 2322) (a)(2)
- Safety Injection Tanks (system No. 2306) (a)(2) (under consideration for (a)(1))

a.2 Inspection Scope for Additional Assessment of (a)(1) Systems

In addition to the above systems, the goals and performance criteria for three additional SSCs in the (a)(1) status were also reviewed in depth and discussed with the responsible system engineers or their designee (but not walked down) to verify that acceptable goals and action plans were established. Guidance on developing maintenance rule action plans was provided by EDI 30730 "Maintenance Rule Goal Setting and Monitoring." This procedure addressed the considerations involved in developing a corrective action plan. All system engineers interviewed were familiar with these considerations. The three systems were:

- Service Water (system No. 2326A)
- Instrument Air (system No. 2332B)
- Emergency Lighting (system No. 2352)

b.1 Observations and Findings

Diesel Generator (EDG) System (System Number 2346A)

The system was in an (a)(2) status and as indicated in the licensee's maintenance rule periodic assessment report had demonstrated average performance in the last 24 months. All four identified system functions were included within the scope of the maintenance rule. Based on the operating condition of Unit 2 (i.e., shutdown, no mode) the performance data were somewhat misleading, the total 'A' EDG unavailability time was tracking at a level less than 20 percent of the allowable unavailability performance criteria and the total 'B' EDG unavailability was tracking at a level less than 20 percent of the allowable unavailability performance criteria. Only the 'B' EDG had experienced a MRFF and that occurred in April 1996.

System deficiencies had been summarized in the System Readiness Evaluation Report and the Maintenance Rule Periodic Assessment Report dated March 12, 1998. The licensee was cognizant of the noted deficiencies and had implemented appropriate corrected actions to resolve these deficiencies. Based on reviews of related documentation, associated corrective actions and discussions with the SE's supervisor and the maintenance rule coordinator (MRC), the team determined that the noted failures and unavailability times had been appropriately captured and tracked by the licensee.

Diesel Rooms Ventilation System (system number 2315E)

The system was in an (a)(1) status and as indicated in the licensee's maintenance rule action plan for the Diesel Room Ventilation report dated March 2, 1998, needed improvement as directed by the expert panel. The system exceeded its performance criteria of < 2 FFs per 24-month rolling period for risk-significant function 1.02. Two FFs of the diesel room ventilation system had occurred during the 24-month evaluation period of October 1994 to October 1996. Since October 1996, three more failures have occurred and were repetitive in nature. 'A' Diesel Room Ventilation System modifications were performed in July 1997 and the 'B' Diesel Room Ventilation System modifications were performed in October 1997. There had been noted improved performance during surveillance following completing these modifications.

System deficiencies had been summarized in the Diesel Room Ventilation report dated March 2, 1998, and the monthly action plan status of April, 1998. The licensee was cognizant of the noted deficiencies and had implemented appropriate corrected actions to resolve these deficiencies.

Structures (Various System Nos.)

The following structures were determined to be in scope by the licensee: Containment, Turbine Building, Intake Structure, Enclosure Building (including control panels), Auxiliary Building (includes spent fuel storage, diesel generator areas and control room), Outside Yard Tanks (CST and RWST), Discharge Canal and Piping, and the Transformer Barrier Walls. All indoor tanks are considered as components of their associated systems or trains. Safety-related cranes and monorails are tested and inspected as a separate SSC by a responsible SE.

The licensee's base line inspections of the in-scope structures were conducted during the period December 1996 through March 1997 by a team of structural engineers. All structures were considered under 10 CFR 50.65(a)(2); because of the licensee's judgement that their conditions had been effectively controlled through preventive maintenance program. Subsequent licensee's inspections will be performed at approximately 3 year intervals. Follow-up inspections will be performed following unusual events such as flooding or an earthquake.

The licensee's observations of structural degradations were categorized in four repair priority criteria (RPC); RPC 1 indicating unacceptable degradation requiring immediate repair, and may require goal setting as per 10 CFR 50.65(a)(1), RPC 2 requiring preventive maintenance, RPC 3 requiring monitoring during successive inspections, and RPC 4 would be without any noticeable degradation.

Summary of Licensee Baseline Observations (licensee's contractor)

- Containment (including internal structures): 18 structural degradations; 14 were categorized as RPC 3, and 4 were categorized as RPC 2.
- Enclosure Building: Roof had membrane blistering and areas of standing water (RPC 2). 20 structural degradations; 8 identified as RPC 2, and 12 identified as RPC3.
- Turbine Building: Condition of roof-RPC 2. 38 structural degradations; 21 were identified as RPC 2, and 17 were identified as RPC 3.
- Auxiliary Building: Condition of roof-RPC 2. 67 structural degradations; 18 were identified as RPC 2, and 49 were identified as RPC 3.
- Intake Structure: Condition of roof-RPC 2. 29 structural degradations; 12 were identified as RPC 2, and 17 were identified as RPC 3.
- Yard Tanks: Eight structural degradations; one was identified as RPC 2, and seven were identified as RPC 3.
- Discharge Canal: Nine structural degradations; Three were identified as RPC 2, and six were identified as RPC 3.

In addition to reviewing the licensee's method of identifying and resolving the structural degradations, the inspector inquired about the licensee's plans to implement the containment inspection rule (10 CFR 50.55a). The licensee's representative stated that the surveillance of prestressing tendons in the prestressed concrete containments is performed in accordance with NRC approved technical specifications. Outside surfaces of concrete, and inside surfaces of liner plate are inspected prior to the integrated leak rate testing of the containment (Appendix J of 10 CFR Part 50). The next inspection of the containment (scheduled for year 2000-2001 time-frame) will be performed as required. The licensee also identified one recurring problem concerning water in some of the hoop tendons.

Since the installation of tendons (about 1972), some of the hoop tendons (16 out of 40) located below the grade level had been found to contain an excessive amount of water during various tendon inspections. In 1977, a consultant investigated the problem and proposed various options to manage the situation. After subsequent continuing problems with water in these tendons, the licensee adopted a plan in 1986, to keep the grease in these tendons under pressure, so that the water could not enter the tendon duct. This approach worked. The licensee is monitoring water in these tendons as an augmented inspection during each normal tendon inspection. As of 1996, the licensee has not encountered water in these tendons.

During the inspection of potential sites for degradation of structures (e.g., intake structure, containment wall intersection with the basemat, steam generator base supports, and yard tanks), the inspector observed that the licensee had effectively implemented the materiel upgrade program. The intake structure floors, walls, circulating water and service water pump supports, and connecting piping were in good condition. In response to questions about the inspection of walls underneath the floor, the licensee representative indicated that the reinforced concrete walls and floor are inspected for signs of structural degradation during each outage by a qualified diver. The condition of caulking at the junction of the containment wall liner and fill concrete was in good condition. The containment liner plate top coat is flaked at several locations. At a few locations the liner metal was exposed (prime coat had peeled off) and there were signs of incipient corrosion. During discussions, the licensee representative noted that they were in the process of developing a corrective action plan to address the situation.

The licensee has developed good administrative controls and criteria for condition monitoring of structures, documentation of findings, and identification of corrective actions. The team was satisfied with the maintenance and general condition of structures at Millstone 2. However, the persistent problem of water intrusion in the hoop tendon raises a question about the condition of reinforcing bars and liner plate in the portion of the containment below grade. The licensee initiated condition report No. M2-98-1505 to conduct an engineering evaluation of the possible effects on the rebar and the containment liner of water in-leakage through the concrete. This CR is currently scheduled to be completed and available for review by the end of September, 1998.

Control Room Air Conditioning System (System 2315A)

The team found that the licensee identified two functions under the scope of the MR for the control room air conditioning (CRAC) system. These system functions were classified as in-scope because they were safety related, normally operating functions, or safety related, standby, accident mitigation functions. These system functions were not identified as risk significant. Consistent with procedure OA10, "Millstone Station Maintenance Rule Program," Revision 2, and its subsidiary instructions, the licensee set the performance criterion for the CRAC system at less than 3 functional failures (FFs) per rolling 24 month period. The team found this performance criterion acceptable.

The licensee identified that the CR HVAC had experienced nine FFs since January 1994, and five of the nine FFs occurred in the last 24 months. These FFs placed the CRAC system under paragraph (a)(1) of the maintenance rule, and the licensee implemented a maintenance rule action plan in January 1996 to improve CR HVAC performance.

Of the nine FFs, the licensee classified four as recurring failures of two components, the air conditioning compressor and the temperature controller. The licensee implemented the design change process to address these recurring failures and established acceptable performance goals and monitoring plans. The team found the corrective action associated with recurring failures of the air conditioning compressors to be particularly effective. These compressors experienced failures during periods of cold weather because the air conditioning condenser was over-cooled by a fan providing cooling air flow to the condenser. By reviewing non-nuclear industry experience, the licensee determined that this condition could be corrected by controlling the speed of the condenser cooling fan to adjust condenser heat removal to an appropriate level for the operating conditions. The licensee installed fan speed controllers as a design change, and these controllers have been effective in preventing further compressor failures.

Through its review of condition reports, trouble reports, and work orders, the team found that the licensee correctly classified most component failures affecting the CRAC system functions. However, the licensee classified the forced shutdown of the "A" control room exhaust fan on July 29, 1996, as a degraded condition rather than a FF because the fan was considered available for emergency use. This event was described in adverse condition report (ACR) M2-96-0196. The ACR stated that an operator identified the condition through abnormal noises generated by the fan during operation, and the fan bearing was degraded to such an extent that "random impacting sounds" were generated when the fan was started for observation. Based on these statements, the team concluded that operation of the fan for the duration of an accident was doubtful and, therefore, the degraded condition could be considered a FF. In addition to fan bearing degradation, the ACR investigation identified resonant vibration of the "A" fan motor mount, and the licensee subsequently replaced the "A" exhaust fan motor to correct degraded motor bearings.

The team considered the degraded classification of the "A" control room exhaust fan motor condition of some significance because corrective actions associated with a maintenance rule FF classification in an (a)(1) system may have identified and corrected similar problems with the "B" control room exhaust fan motor before its failure on April 29, 1998. Classification of the 'A' CRAC system as degraded vice a MRFF is similar to the SE recommendation for the level transmitter problems in the SIT system (pp 13-14) and is considered to be an implementation problem in determining FFs. However, the incorrect determination did not result in an incorrect system classification. The NRC staff will perform additional evaluation following plant restart when there will be sufficient additional challenges to adequately assess SE MRFF determinations **(part of IFI 50-336/98-02-01)**.

<u>Shutdown Cooling (SDC) System (System 2310)</u>

The SDC system was classified as a maintenance rule (a)(2) system with no FFs and no unavailability. Because the reactor has been in conditions where less than two trains of SDC were required operable (i.e., unavailability tracking was not required) for an extended period and the system has not been subject to demands through operability testing (i.e., limited opportunity for component failure), the performance data available for trending was minimal. Team review of condition reports, trouble reports, and work orders indicated that no FFs of the SDC occurred in the last 24 months. The licensee had reviewed earlier information to develop trends. However, the team concluded that insufficient information was available to adequately assess the effectiveness of maintenance and the licensee's performance monitoring of the SDC system. The team determined that performance criteria established for monitoring the system were acceptable.

<u>System Boundaries</u>

During the review of the SDC system, the team reviewed how the licensee tracked performance of functions when components from multiple systems were necessary to perform the function. The team found that system boundaries were generally based on the Production Maintenance Management System (PMMS) database designations, with exceptions for some functions that encompassed multiple systems (e.g., containment isolation function). However, the team noted that, because of the many system interfaces, many functions crossed system boundaries among the SDC, CS, LPSI, high pressure safety injection (HPSI), and chemistry and volume control (CVCS) systems. The team found that the boundaries for some functions were adequately defined by detailed descriptions of boundaries (e.g., RCS cooling during shutdown) or by separation of functions into subfunctions within system boundaries (e.g., boron injection function divided into boron supply to charging pumps function and inject boron into reactor coolant system loops function). However, boundaries for other risk significant functions were not clearly defined (e.g., LPSI long term boron precipitation control function, which relies on portions of the SDC and CVCS systems). Clear program/procedural definitions of function boundaries are necessary for meaningful performance monitoring. The NRC staff will review this item following licensee evaluation and resolution (**part of IFI 50-336/98-02-01**).

Chemistry and Volume Control System (CVCS) (System 2304A)

The CVCS system was classified as a maintenance rule (a)(2) system with three historic FFs, but no FFs in the last 24 months. Unavailability of the CVCS charging function was tracked. Because the reactor has been in conditions where charging has not been necessary and the system has not been subject to demands through operability testing, the performance data available for trending was minimal. Therefore, the team concluded that insufficient information was available to adequately assess the effectiveness of maintenance and the licensee's performance monitoring of the CVCS system. The team concluded the performance criteria were acceptable.

Reactor Protection System (RPS) (System No. 2046)

The reactor protection system was a risk significant system consisting of four channels which receive inputs from process instrumentation and generate signals to open the reactor trip breakers. The system included the instrumentation and reactor trip breakers, but did not include the SPEC 200 signal conditioning equipment which processed instrumentation signals for input into the RPS. The RPS was in the MR (a)(2) status.

The performance criteria listed in the scoping document for this system were less than 4 FFs per rolling 24 month period and less than 4 hours per 24 months unavailability. Discussion with the system engineer and unit maintenance rule coordinator clarified that this was intended to mean no more than one FUNCTIONAL FAILURES per channel and less than 4 FFs total fr all channels, and less than 4 channel - hours unavailability. The maintenance rule coordinator intended to clarify the wording of the criteria.

The splitting of the system function into the RPS and the SPEC 200 was handled by counting FFs against the individual system and counting unavailability against the end function, such that a loss of a instrument channel due to SPEC 200 would be a SPEC 200 FUNCTIONAL FAILURES, but channel unavailability would count against the RPS criteria. The reason for this split was that SPEC 200 processed other signals and generated more outputs than just those associated with RPS. To assure that failure and unavailability accounting was handled as intended, the SPEC 200 system scoping document listed system interfaces.

Two maintenance rule FFs had occurred in the prior 24 months. One was that the Core Protection Calculator channel D TM/LP trip was found out of specification during a calibration; the second was that one of the six trip matrices was rendered inoperable by a shorted non-QA indicating light. A CR was generated to evaluate the indicating lights.

The team concluded that the RPS was being appropriately monitored.

<u>480 volt motor control centers (MCC) (System No. 2344A)</u>

This 480 volt MCC system was a risk significant system consisting of 4 MCCs supplying vital loads and 13 MCCs supplying in-scope non-vital loads. Performance criteria for this system were based on a combination of PRA data (for loss of an MCC) and industry data (for loss of individual load breakers). This system was in an (a)(1) status due to exceeding the performance criteria of <2 repetitive FFs in a 36 month period. Four failures had occurred, all instances of sticking or binding auxiliary contact assemblies.

The cause of the failures were differences in internal clearances as a result of manufacturing tolerances; contact assemblies with smaller clearances were the failures. Corrective action was to replace the relevant contact assemblies with a newer model with greater clearances. Goals and monitoring were appropriately no failures due to these contact assemblies for an 18 month period that would commence with plant startup (since many MCCs are out of service with the plant shut down). The corrective action plan for this system identified a new system function: "provide cooling of MCCs". The maintenance rule coordinator determined that this particular function belonged to a system other than the MCCs, however it appeared that it had not actually been assigned to any system. The facility generated a CR concerning this discrepancy. The inspector concluded that this system was otherwise being appropriately monitored.

<u>Containment Isolation (System No. 2003)</u>

The containment isolation system was a risk significant maintenance rule "pseudo-system" consisting of all containment penetrations and isolation valves regardless of what individual system the particular components belong to. Performance criteria for this system included failures 10CFR50 Appendix J types A, B, and C leak rate tests and failures to close within defined stroke time limits for risk significant valves.

This system was being considered for (a)(1) status due to two instances in October and November of 1995 when containment hydrogen purge isolation valve 2-EB-100 failed to close within its 5 second stroke time requirement. The need to evaluate these failures as possible reason for (a)(1) classification was identified during a March, 1998 maintenance rule periodic assessment. Although this recognition of potential repetitive FFs was not timely, review of the maintenance history of this valve indicates that the facility was aware of and troubleshooting these failures. The facility observed valve operation and increased surveillance frequency after the first failure. They were unable to find anything wrong with the valve but suspected the air operator solenoid. This solenoid was replaced during the current shutdown, after which the valve did not work at all. Troubleshooting and engineering evaluation were still in progress, and whether the system would be considered (a)(1) would depend on whether or not the valve failures were due to an engineering deficiency.

The system was walked down with two system engineers and trending of leakrate test results were reviewed. The team considered this system to be appropriately monitored.

Auxiliary Feedwater (AFW) (System No. 2322)

The system was in an (a)(2) status. The licensee's maintenance rule periodic assessment report had documented monitored system functions were within the performance criterion for the last 24 months.

Based on interviews with the SE's supervisor, review of related documents, and walkdown of the AFW pump rooms the material condition of the system was very good. *Unavailability hours were not being tracked because of the current plant* operating mode. The team determined that the AFW system was being appropriately monitored by the licensee.

Safety Injection Tanks (SIT) (system No. 2306) (a)(2)

The system was in an (a)(2) status and was in the process of being evaluated for placement into (a)(1) status due to previous level indication problems. All five identified functions were included within the scope of the maintenance rule.

During discussions with the inspector the SE noted that he was currently in the process of developing a response to condition report (CR) M2-98-1105 which was initiated as a result of the licensee's recent periodic evaluation required by (a)(3) of the MR. The periodic evaluation identified several adverse condition reports (ACR) from 1995 concerning level transmitter LT-311, function 1.03 for the system. The inspector reviewed a copy of the SE's response to the CR and noted that it indicated only one MRFF. The CR identified multiple ACRs which would put the system in the (a)(1) category if each ACR was determined to be a MRFF. The root cause investigation dated February 20, 1996, determined that level indication problems were due to moisture accumulation in the dry leg of the level transmitter. The source of the moisture was uncertain. Several corrective actions were recommended at that time. Procedural recommendations have been implemented, to prevent overfill of the SIT and transmitter equalizing valves have been removed in accordance with a recommended design change. The licensee is considering other design changes that were recommended. During the tour the SE and the inspector noted that two of four of the safety injection tank's level transmitter dry legs had tubing bends near the transmitters that would cause a small loop seal arrangement and make elimination of fluids from the sensing line more difficult.

The team's review of the level instrument problems indicated that they appeared to be caused by a combination of design (tubing run) and maintenance preventable functional failures (MPFF). The team's conclusion of one functional failure (actual transmitter failure) and one MPFF (subsequent inability of transmitter to provide accurate level indication) was based on the fact that the water in the dry leg was a known problem and it was not effectively removed by the maintenance personnel. The SE's conclusion did not consider the subsequent failure to be a MPFF. The difference is somewhat due to the interpretive nature of the problem and whether it is primarily due to a design or maintenance issue. In either case the Expert Panel is scheduled to review and decide how many failures occurred and if the system should be placed in the (a)(1) status. Neither the SE's or the team's conclusion would place the system in the (a)(1) status for the 1995 level indication problem; however the team viewed this issue similar to the issue noted in the control room air conditioning system (pp 9-10). **(part of IFI 50-336/98-02-01)**

c. <u>Conclusions for b.1</u>

The licensee, with few exceptions, appropriately identified system functional failures as they occurred and these failures were well known and understood by the responsible SE. The related corrective action had been suitably captured in the corrective action program, and appropriate corrective actions had been instituted. The team reviewed goals and corrective actions established by NE for identified (a)(1) SSCs and found them to be acceptable. SSC performance criteria were appropriately linked to the PRA. The overall material condition of the SSCs walked down was good.

The team also identified that physical boundaries for functions that relied on components in multiple systems were not clearly defined for performance monitoring, which could result in an incorrect assessment of maintenance effectiveness. Also, the team noted an implementation problem in the determination of MRFFs during the review of the CRAC and SIT systems. Collectively, these implementation problems will be reviewed by NRC staff during a future inspection following plant restart. **(part of IFI 50-336/98-02-01)**

The team found that, because of the recent operating status of Millstone Unit 2, the operational history of many normally operating systems and the start demands on many standby systems have been insufficient to adequately assess the effectiveness of the licensee's maintenance and performance monitoring programs. These activities will be reviewed during a future inspection **(part of IFI 50-336/98-02-02)**.

The team determined that appropriate goal setting was in place for those SSCs that were in an (a)(1) status. The team also concluded that corrective and preventive maintenance was appropriate and effective for those SSCs in (a)(2).

Additional Assessment of (a)(1) Systems

b.2 Observations and Findings

Service Water (System No. 2326A)

This system was in an (a)(1) status as of the implementation of the maintenance rule due to exceeding the system performance criteria of <2 functional failures (FUNCTIONAL FAILURES) and less than 6% contribution to unplanned capability loss factor (UCLF). The system had experienced 3 FFs and 16.5% contribution to UCLF during the original performance assessment period. The cause determination and corrective action for these failures listed 9 line items. Of these 9 items, 8 had been completed, the last was the development of an inspection program for the system.

Five goals were established for the system concerning specific failures, completion of corrective actions, and system performance. The action plan specifically discussed industry experience, safety considerations, and adequacy of existing criteria in developing these goals. All required evaluation criteria were addressed by this plan.

Instrument Air (System No. 2332B)

This system was placed in (a)(1) status at maintenance rule implementation due to exceeding the performance criteria of <4 FFs per 24 months. Eleven FFs occurred during the original evaluation period with a total of 17 FFs including the most recent system update. The corrective action plan for this system lists 22 items, including replacement of compressors and the development of new preventive maintenance items as well as repair of specific failures. Approximately half of these actions or portions thereof were complete. Six goals were established to evaluate the effectiveness of these actions for both particular components and the overall system. All required evaluation criteria were addressed in this plan.

Emergency Lighting (System No. 2352)

The appendix R emergency lighting system was placed in (a)(1) status due to a total of 105 FFs since the start of the evaluation period with 58 FFs in the past 24 months; performance criteria was < 6 FFs per 24 months.

The revision 0 action plan identifies batteries as the most significant problem both for this facility and industry wide and proposed a plan to replace all the batteries and then monitor ambient conditions to attempt to predict battery life and develop a replacement schedule. This plan also evaluated the current performance criteria as far too restrictive and proposed a relaxation.

The expert panel rejected this particular action plan; it wanted further information on battery age and did not wish to relax performance criteria without further assessment of whether the equipment could be made to achieve those criteria. Although the plan specifics were not accepted, the plan did address all required considerations per facility and NUMARC guidance.

c. Conclusions for M1.4b.2

The facility placed systems in an (a)(1) status when necessary and developed action plans with appropriate corrective actions and goals to improve system performance. The expert panel critically evaluated these action plans. Goals and performance criteria were established in a manner that would assure the systems are capable of performing their intended safety function.

M1.5 Periodic Evaluations (a)(3) and Plant Safety Assessments Before Taking Equipment Out-of-service

a. Inspection Scope

Paragraph 10CFR50.65(a)(3)requires that periodic evaluations be performed and adjustments be made where necessary to assure that the objectives of preventing failures through the performance of preventive maintenance is appropriately balanced against the objectives of minimizing unavailability due to monitoring or preventive maintenance. The team reviewed two of Millstone's (a)(3) periodic assessments and related implementing procedures. This first (a)(3) periodic assessment was identified as "Maintenance Rule Periodic Assessment at Millstone Station Unit No. 2," issued July 22, 1996, and was conducted between June 3-7, 1996. The second (a)(3) periodic assessment was identified as "Millstone 2's Maintenance Rule Periodic Assessment," issued May 14, 1998, and was conducted between March 23 - April 3, 1998. These two assessments were performed by the licensee to meet the requirements of 10 CFR 50.65 (a)(3).

Paragraph (a)(3) also states that the total impact on plant safety should be taken into account before taking equipment out of service for monitoring or preventive maintenance. The team reviewed the licensee's procedures and discussed the process for implementing this portion of the rule with the IPE representative, plant operators, and work control personnel.

b. Observations and Findings

b.1 (a)(3) Periodic Evaluations and Balancing Reliability and Availability

The licensee's program that established guidance on the method to performing (a)(3) periodic assessment was addressed in Millstone Maintenance Rule Program Procedure OA 10, rev. 2, "Millstone Station Maintenance Rule Program" and Engineering Department Instruction (EDI) 30740, "Maintenance Rule Periodic Assessment."

The periodic (a)(3) assessments concluded that there were several recommendations needed to accomplish to improve the overall maintenance rule program. Depending on the specific assessment, these recommendations were categorized in the following areas: performance assessment (system performance); goal setting and monitoring; balancing availability and reliability; equipment removal from service; scoping and risk significance revisions; maintenance rule awareness; industry operating experience; technical support self-assessment; expert panel proceedings; and corrective actions from previous periodic assessments.

Each of the noted recommendations and associated corrective actions from both (a)(3) periodic assessments were being captured and tracked by the licensee. Noted action requests reports were being issued as specified in the Corrective Action Program.

Nonetheless, during this inspection, the NRC team and the May 1998 (a)(3) periodic assessment identified several examples of where items identified during the initial July 1996 (a)(3) periodic assessment remained open. The team felt that some of the corrective actions associated with several of the open items were justifiably late due the plant condition (i.e., shutdown); however, others were processing slowly.

The periodic assessments and EDI 30740, rev. 1, documented the process that Millstone used for the application of actual performance compared to the selected performance criteria to balance availability and reliability for SSCs. The licensee also made certain recommendations in the periodic assessment to improve certain SSCs as they related to balancing unavailability and reliability. This process was emphasized within the MR program documents. Further, the evaluation and EDI noted additional support programs that enhance balancing unavailability and reliability. These support programs included: PM Optimization Program, On-line Maintenance Procedures and PRA Risk Monitor. However, based on Units 2 being shutdown and defueled (i.e., a no mode condition) and not needing the availability of numerous SSCs, there was an absence of unavailability data. Based on the absence of data, balancing unavailability and reliability will be reviewed when data becomes available, following Unit 2 restart **(IFI 50-336/98-02-02)**.

c. Conclusions for M.1.5b.1

Based on the review of the program documents and the two (a)(3) periodic assessments, the team noted that these assessments were comprehensive and identified valid findings. The program adequately implemented balancing availability and reliability. The evaluation reflected a thorough approach and it met the requirements of paragraph (a)(3) of the rule for balancing availability and reliability. Follow-up activity will be accomplished when unavailability data becomes present after start-up. The balancing of unavailability and reliability data, when it becomes available, will be further reviewed. **(part of IFI 50-336/98-02-02)** b.2 Safety Assessments Before Taking Equipment Out-Of-Service for Maintenance

The licensee's process for assessing on-line plant safety when SSCs are taken out-of-service was documented in Procedure C-WPC 4, Revision 0, "Online Maintenance" (February 22, 1996). Additional PRA-related guidance was documented in Safety Analysis Branch Procedure SAB 3.08, Revision 2, "Risk Monitor" (July 9, 1996). Before Millstone Unit 2 shut down in early 1996, the procedure for evaluating plant safety was to have the PRA group evaluate plant risk from planned maintenance outages (using the IPE) approximately two weeks before the work actually began. Any additional planned work, emergent work, or work that would extend beyond its planned completion date was also evaluated by the PRA group. No risk matrix or on-line risk monitor was used at that time.

Because Millstone Unit had been shut down since early 1996, the licensee's performance in the area of on-line risk evaluation could not be observed and evaluated. Based on the absence of data, performance in the area of on-line risk evaluation and management will be inspected following plant restart **(IFI 50-336/98-02-02)**.

The licensee's process for assessing plant shutdown safety when SSCs are taken out-of-service was documented in Procedure OM 2, Revision 2, "Shutdown Risk Management" (May 12, 1998) and Procedure OP 2264, Revision 5, "Conduct of Outages" (April 17, 1997). Additional PRA-related guidance was provided in Safety Analysis Branch Procedure SAB 3.07, Revision 1, "Risk Profiles for Refueling Outages" (August 28, 1995). According to these procedures, approximately two months before the start of a scheduled outage, the PRA group was to develop a shutdown risk profile for the Master Outage Schedule. In addition, weekly and daily risk (green, yellow, orange, or red) was to be evaluated using the guidance provided in OP 2264, which included risk evaluation sheets for various plant modes (including the present situation in which the core was off-loaded to the spent fuel pool). The shutdown risk sheets were based on industry guidance provided by NUMARC and INPO, based on the concept of protected paths for areas such as the following: power availability, decay heat removal, inventory (makeup) control, spent fuel pool area ventilation boundary, and reactivity control. For emergent work resulting from SSC failures, the licensed operators performed the risk evaluations, with reviews from the shift managers.

c. Conclusions for M1.5b.2

The licensee's procedure for assessing plant risk while the plant is shut down was considered to be acceptable. However, because Millstone Unit 2 had been shut down for over two years, the licensee's actual performance in the area of on-line risk evaluation could not be assessed **(part of IFI 50-336/98-02-02)**.

M2 Maintenance and Material Condition of Facilities and Equipment

a. Inspection Scope

The team performed walkdowns of those systems in which vertical slice inspections were performed. These system walkdowns were performed with the responsible system engineer, during which time the teams observed the material condition of the SSCs.

b. Observations, and Findings

The team performed material condition walkdowns of selected portions of those SSCs selected for detailed reviews. Housekeeping in the general areas around systems and components was good in the plant areas toured. Within the containment structure the team noted that components exhibited peeling paint. There was also loose material from ongoing activities and it did not appear that the containment in general had been cleaned recently. The material condition of the equipment observed was acceptable and function did not appear to be impaired. System engineers were cognizant of their system responsibilities, which included an awareness of the material conditions for those systems in which they were assigned.

c. Conclusions

The inspection team determined that the overall material condition of those SSCs selected for review were being maintained in good condition. Housekeeping was generally good except for conditions inside the containment.

M4 Staff Knowledge and Performance

a. Inspection Scope

The team interviewed engineers, managers and licensed operators to assess their understanding of the maintenance rule and associated responsibilities.

b. Observations and Findings

The team determined that the SEs had a good knowledge of their systems and acceptable knowledge of the maintenance rule requirements and their associated responsibilities. The team noted that some SEs were not certain how to consider boundaries and interfaces of functions associated with certain systems (see CVCS and SDC in Section M1.4). The SEs indicated, that they had a direct input in the development of the performance criteria and goals when implementing MR requirements.

The team interviewed a shift manager and a unit supervisor regarding their knowledge of the maintenance rule and its impact on plant operations. General training on maintenance rule responsibilities was provided during recent operator training, and these licensed senior reactor operators had adequate knowledge of the maintenance rule. Operators were aware of the licensee's procedural requirements for documentation of major equipment status changes in the Shift Manager's Log and how that information was used for unavailability monitoring. The operators also were knowledgeable regarding implementation of outage risk management procedures. However, operators were not familiar with risk management tools developed for on-line maintenance due to the current plant operational status.

c. <u>Conclusion</u>

SEs had good knowledge of their systems and acceptable knowledge of their MR responsibilities including scoping, monitoring, and trending. The SEs weak understanding oof system boundaries and interfacing functions appears to be due to unclear procedural guidance (see p11).

Licensed operator's understanding of the maintenance rule was acceptable. However, operators were not familiar with risk management tools developed for on-line maintenance due to the current plant operational status (**part of IFI 50-336/98-02-02**, see Paragraph M1.6).

M7 Quality Assurance (QA) in Maintenance Activities

a. <u>Inspection Scope</u>

The team reviewed (a)(3) evaluations and audits conducted by Millstone personnel to determine if the licensee had conducted in-depth evaluations of the maintenance rule program and its implementation.

b. <u>Observations and Findings</u>

The team reviewed evaluations and a Nuclear Oversight audit of Units 2 and 3 of the maintenance rule program implementation and determined that these assessments were detailed and thorough and provided appropriate feedback for maintenance rule program improvements. Condition report M2-97-1579 identified several programmatic deficiencies at Unit 2 which were related to the maintenance rule coordinator position being vacant for a period of time causing a general loss of focus on the Unit 2 MR program. This vacancy has been filled with an individual that is a certified Reliability Engineer. Industry operating experience was incorporated, as appropriate, together with the audit reviews, thus incorporating the most recent interpretations of the rule. Audit findings were being dispositioned and acted upon by the licensee. Long term corrective actions are actively being tracked and reviewed.

c. <u>Conclusions</u>

The self assessments and audit reports were detailed and thorough. The thoroughness of the audit findings helped to ensure that Millstone 2 is correctly implementing the requirements of the maintenance rule. Filling the vacancy of the maintenance coordinator with a certified Reliability Engineer is considered a positive step to ensure a strong background in equipment reliability.

M8 Miscellaneous Maintenance Issues

M8.1 Millstone Unit 3 Performance Criteria Issue As part of the Millstone Unit 3 NRC Operational Safety Team Inspection (OSTI) effort, the Unit 3 Maintenance Rule performance criteria for high safety significance SSCs were reviewed. That review identified several SSCs with reliability performance criteria (allowable numbers of functional failures per 24-month period) that appeared to be too high. As part of the Unit 2 Maintenance Rule baseline inspection, the Unit 3 reliability performance criteria were reviewed to assist in the closure of this issue.

The licensee had originally used the EPRI guidance of 1% to determine the acceptable reliability performance criteria for risk significant systems. Late in 1997, subsequent to Millstone 3 calculations, standard industry practice became the use of EPRI guidance of 5%. Since the 5% method is more conservative a recalculation could result in fewer functional failures (more conservative performance criterion) being allowed for risk significant systems.

The team reviewed the bases for 16 of the Millstone Unit 3 SSC reliability performance criteria. As a direct result of the review of the licensee's use of the 1% versus the 5% determination of reliability performance criteria one of the 16 SSCs had reliability performance criteria that were judged by the team to be too high. This determination was based on the licensee's procedure outlined in NUSCO PSA Guideline #6, "Technical Basis for Functional Failure Count Performance Criteria," (September 9, 1997). The emergency diesel generator (system 3346A, function 1.01) should have had a reliability performance criterion of less than 3 FFs per diesel generator over a 24-month period, rather than the existing criterion of less than 4 FFs. It should be noted that the licensee had not performed a sensitivity analysis to determine the impact on CDF of this recently identified performance criteria change. Therefore, the licensee had not demonstrated that this performance criterion was commensurate with safety.

The licensee had also identified the need to review its Unit 3 reliability performance criteria, as indicated in the Condition Report (CR) M3-98-1976 (April 15, 1998). That CR recommended that all high safety significance SSC performance criteria be reviewed. A completion date of October 16, 1998 was listed in the CR. The review of the performance criteria had not started at the time of the inspection. The licensee's review and resolution of this item will be inspected during a future NRC inspection (IFI 50-423/98-02-03).

M8.2 (Closed) Violation 50-336/97-80-01 and 50-423/09-80-01: Licensee failed to include SSCs in scope of the MR that should have been included. The inspector reviewed the licensee's response to the notice of violation to verify that identified systems were addressed. The SSCs were verified to be included in the licensee's scoping documents and identified as within the scope of the MR. The licensee also identified several additional SSCs that were included within the scope of their MR program. This item is closed.

M8.3 (Closed) Follow Item 50-336/97-80-02: Review and evaluate licensee's phase 2 scoping. The team reviewed the licensee's phase 2 (determination of SSC functions that are included in the MR). The weaknesses identified during the 97-80 inspection were verified as being incorporated within the licensee's program. In addition the team verified that, for the systems reviewed, appropriate SSC functions were incorporated and being monitored within the scope of the licensee's MR program. This item is closed.

V. Management Meetings

X1 Exit Meeting Summary

The team discussed the progress of the inspection with Millstone representatives on a daily basis and presented the inspection results to members of management at the conclusion of the inspection on May 22, 1998.

The team asked whether any materials examined during the inspection should be considered proprietary. The utility indicated that none of the information provided to the team was considered proprietary.

X1.1 Final Safety Analysis Report Review

A recent discovery of a licensee operating their facility in a manner contrary to the Final Safety Analysis Report (FSAR) description highlighted the need for a special focussed review that compares plant practices, procedures, and parameters to the FSAR descriptions. While performing the inspection discussed in this report, the team reviewed selected portions of the FSAR. During the detailed system vertical slice reviews, the team noted one statement where information contained in the FSAR was possibly misleading. This statement was contained in paragraph 9.9.11.1.2 and dealt with Diesel Rooms Ventilation System. The statement was not in error, but could be interpretive and its wording was somewhat misleading.

PARTIAL LIST OF PERSONS CONTACTED

NNECo. (in alphabetical order)

D. Amerine, Vice President, Human Resources
E. Annino, Millstone Unit 2 Coordinator, Regulatory Compliance
M. Ahern, Manager, Unit 2 Design Engineering
M. Bain, Manager, Unit 2 Technical Support
R. Borchert, Supervisor Reactor Engineering, Unit 2 Technical Support
S. Brinkman, Engineering Director, Unit 2 Engineering
D. Dube, Manager, Safety Analysis, Nuclear Engineering
B. Duffy, Unit 2 Maintenance Manager
E. Dundon, Unit 2 Maintenance Rule Coordinator
K. Hastings, Maintenance Rule Program Manager
S. Jordan, Assistant Director, Unit 2
J. Powers, Senior Engineer, PRA Section
J. Price, Director, Millstone Unit 2
T. Ryan, Unit 3 Maintenance Rule Coordinator
R. Spooner, Unit 1 Maintenance Rule Coordinator

LIST OF INSPECTION PROCEDURES

IP 62706 Maintenance Rule

LIST OF ITEMS OPENED

Number	Type	Description
50-336/98-02-01	IFI	The following two items reflect implementation problems and will receive further NRC evaluation following plant restart. • Perform additional evaluation of system engineer determinations of maintenance rule functional failures following plant restart. Two examples: Paragraph M1.4, system 2315A and system 2306. • In addition, further evaluation will be conducted of the licensee's action to clarify definitions of functional boundaries between interfacing and overlapping systems.
50-336/98-02-02	IFI	Due to current plant status the following three items will require further NRC evaluation during operations. • Licensee's maintenance and performance monitoring subsequent to plant restart when sufficient SSC operability and start demands have accumulated.

- Balancing reliability and unavailability subsequent to plant restart (Paragraph M1.5).
- Review operations knowledge and use of on-line maintenance risk assessment following plant return to on-line (Paragraph M1.5).

50-423/98-02-03	IFI	NRC to review Millstone 3's evaluation and resolution of Condition Report M3-98-1976 on high confidence level of reliability performance criteria.

LIST OF ITEMS CLOSED

Number	Type	Description
50-336/97-80-01	VIO	Licensee failed to include several SSCs within the scope of the MR program that should have been included.
50-423/97-80-01	VIO	Licensee failed to include several SSCs within the scope of the MR program that should have been included.
50-336/97-80-02	IFI	Review and evaluate licensee's phase 2 scoping.

PARTIAL LIST OF PROCEDURES AND DOCUMENTS REVIEWED

OA 10, "Millstone Station Maintenance Rule Program," Revision 2, 4/8/98

Millstone Unit No. 2 Individual Plant Examination (IPE) for Severe Accident Vulnerabilities, 12/93

Millstone Unit 2 IPE for External Events, 12/95

Millstone Nuclear Power Station Unit 2 IPE Staff Evaluation Report, 5/96

SAB 3.03, "Update and Maintenance of PC Based Plant PRA Models," Revision 4, 2/20/98

Program Instruction PI 2, "Risk Significance Determination," Revision 2, 5/1/97

NUSCO PSA Guideline #3, "Maintenance Rule Form 5 Update Methodology," 7/19/96

NUSCO PSA Guideline #10, "Incorporating IPEEE Insights into Maintenance Rule," Revision 1, 6/5/97

"Millstone Unit 2 Maintenance Rule Unit Basis Document", Revision 1, 4/29/98

Program Instruction PI 3, "Performance Criteria," Revision 3, 2/14/97

NUSCO PSA Guideline #7, "Technical Basis for Unavailability Performance Criteria," 3/10/97

NUSCO PSA Guideline #6, "Technical Basis for Functional Failure Count Performance Criteria," Revision 2, 9/9/97

C-WPC 4, "Online Maintenance," 2/22/96

SAB 3.08, "Risk Monitor," Revision 2, 7/9/96

OM 2, "Shutdown Risk Management," Revision 2, 5/12/98

OP 2264, "Conduct of Outages," Revision 5, 4/17/97

SAB 3.07, "Risk Profiles for Refueling Outages," Revision 1, 8/28/95

Millstone Maintenance Rule Program Procedure OA 10, rev. 2, "Millstone Station Maintenance Rule Program."

Engineering Department Instruction (EDI) 30700, rev. 0, "Maintenance Rule Unavailability Monitoring."

EDI 30710, Revision 0, "Maintenance Rule Functional Failures."

EDI 30740, Revision 1, "Maintenance Rule Periodic Assessment."

Integrated Preventive Maintenance Program Instruction (PI) 3, Revision 3, "Performance Criteria."

Integrated Preventive Maintenance PI 4, rev. 2, "Performance Evaluation."

PI 1-1, Revision 2, "Phase 1 Scoping."

PI 1.2, Revision 1, "Phase 2 Scoping."

Nuclear Energy Institute, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," NUMARC 93-01, Revision 2, April 1996.

Nuclear Oversight Audit MP-97-A08-01, "Maintenance Rule and Corrective Maintenance/Preventive Maintenance Program 1997," October 3, 1997.

LIST OF ACRONYMS USED

AFW	Auxiliary Feedwater
ALARA	As Low As Reasonably Achievable
ANI	American Nuclear Insurers
AOV	Air Operated Valve
AR	Action Report
ASME	American Society of Mechanical Engineers
CAFTA	Computer Assisted Fault Tree Application
CCW	Component Cooling Water
CDF	Core Damage Frequency
CFR	Code of Federal Regulations
CM	Corrective Maintenance
CR	Control Room
CVCS	Chemical and Volume Control System
EDG	Emergency Diesel Generator
EOOS	Equipment Out-of-Service
EOPs	Emergency Operating Procedures
EPRI	Electric Power Research Institute
ESF	Engineered Safety Feature
ESFAS	Engineered Safety Features Actuation System
EWR	Engineering Work Request
FF	Functional Failure
FHA	Fire Hazards Analysis
FPE	Fire Protection Engineer
FV	Fussell-Vesely
GET	General Employee Training
HVAC	Heating Ventilation and Air Conditioning
IFI	Inspector Follow-up Item
IP	Inspection Procedure
IPE	Individual Plant Examination
IPEEE	Individual Plant Examination of External Events
IR	Inspection Report
ITS	Improved Technical Specification
LCO	Limiting Condition for Operation
LER	Licensee Event Report
LERFs	Large Early Release Fractions
LOCA	Loss of Coolant Accident
LTOP	Low Temperature Over Pressure Protection
MOV	Motor-Operated Valve
MPFF	Maintenance Preventable Functional Failure
MR	Maintenance Rule
NI	Nuclear Instrument
NORMS	Nuclear Operations Records Management System
NRC	Nuclear Regulatory Commission
NRR	Nuclear Reactor Regulation
NSARB	Nuclear Safety Audit and Review Board
NUMARC	Nuclear Utility Management and Resource Council
NUSCo	Northeast Utilities Service Company
OSTI	Operational Safety Team Inspection

PC	Performance Criteria
PCN	Procedure Change Notice
PCR	Procedure Change Request
PI	Program Instruction
PMEA	Periodic Maintenance Effectiveness Assessment
PORC	Plant Operations Review Committee
PORV	Power-Operated Relief Valve
ppm	parts per million
PRA	Probabilistic Risk Assessment
PSA	Probabilistic Safety Assessment
PT	Periodic Test
QA	Quality Assurance
QAOR	Quality Assurance Occurrence Reports
QC	Quality Control
RAT	Risk Assessment
RAW	Risk Achievement Worth
RCA	Radiologically Controlled Area
RCP	Reactor Coolant Pump
RCS	Reactor Coolant System
RG&E	Rochester Gas and Electric Corporation
RHR	Residual Heat Removal
RP&C	Radiological Protection and Chemistry
RPS	Reactor Protection System
RRW	Risk Reduction Worth
RWST	Refueling Water Storage Tank
SAB	Safety Analysis Branch
SAFW	Standby Auxiliary Feedwater System
SBO	Station Blackout
SER	Safety Evaluation Report
SFP	Spent Fuel Pool
SGTR	Steam Generator Tube Rupture
SI	Safety Injection
SSCs	Structures, Systems and Components
ST	Surveillance Test
TCP	Transient Combustibles Permit
TGM	Toxic Gas Monitor
T/PM	Test/Preventive Maintenance
TS	Technical Specifications
TSC	Technical Support Center
UFSAR	Updated Final Safety Analysis Report
UL	Underwriter's Laboratory
URI	Unresolved Item
VAC	Volts Alternating Current
VIO	Violation